PROGRAM REVIEW
1984-85

NEWFOUNDLAND FOREST RESEARCH CENTRE

Government of Canada
Canadian Forestry Service

Gouvernement du Canada
Service canadien des forêts

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1984-85
Newfoundland Forest Research Centre
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Government of Canada

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THE CANADIAN FORESTRY SERVICE
GOVERNMENT OF CANADA

The Canadian Forestry Service (CFS) is the principal source of federal expertise in forestry. Its general objective is to promote the wise management and use of Canada's forest resources for the economic, social, and environmental benefit of Canadians.

The following are the main functions of the CFS:

1. coordination of federal policies, for the promotion of better resource management and forest industry development;
2. provision of scientific and technological leadership in forestry through research and development;
3. provision and analysis of national and international statistics and information as a basis for policy formulation;
4. development and certification of codes and standards for wood product performance;
5. protection of Canada's forests from foreign pests;
6. fostering the potential use of the forest resource for energy;
7. contributing to the environmental objectives of the government of Canada.

A number of federal agencies are involved in forestry programs and a Federal Forest Sector Strategy Committee has been established to coordinate federal forestry activities. The CFS has been designated the lead agency.

The CFS comprises a headquarters unit, six forest research centres, and two national institutes. The forest research centres are responsive to regional priorities and maintain close liaison with the respective provincial government forestry departments and other clients. They also participate in, and frequently lead, national programs. The national institutes provide the focus for programs of national scope.

SERVICE CANADIAN DES FORÊTS
GOUVERNEMENT DU CANADA

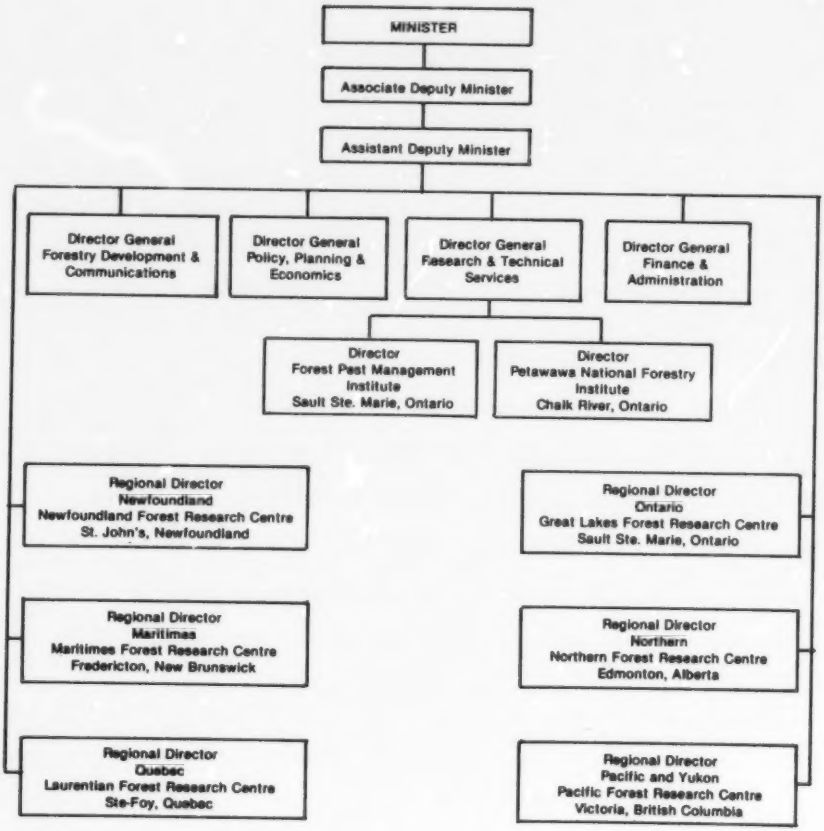
Le Service canadien des forêts (SCF) réunit la majorité des spécialistes fédéraux en foresterie. Son objectif général est de promouvoir l'aménagement et l'utilisation judicieux des ressources forestières du Canada pour le plus grand bien économique, social et environnemental des Canadiens.

Voici les principales fonctions du SCF:

1. coordonner les politiques fédérales afin de favoriser l'amélioration de la gestion des ressources et l'expansion de l'industrie forestière;
2. fournir une orientation scientifique et technologique dans le domaine de la foresterie, par la recherche et le développement;
3. fournir et analyser les statistiques et l'information nationales et internationales qui serviront à établir les politiques;
4. mettre au point et homologuer des codes et des normes en matière de rendement des produits du bois;
5. protéger les forêts canadiennes en luttant contre les ravageurs étrangers;
6. parrainer l'utilisation éventuelle des ressources forestières pour la production d'énergie;
7. adhérer aux objectifs environnementaux du gouvernement fédéral.

Divers organismes fédéraux participent aux programmes forestiers, et un comité stratégie forestière fédérale a été créé pour coordonner les activités fédérales en matière de foresterie. Le SCF a été désigné organisme directeur.

Le SCF comprend une administration centrale, six centres de recherches forestières et deux instituts nationaux. Les centres recherches forestières doivent répondre aux impératifs régionaux et entretenir une liaison étroite avec les ministères provinciaux des Forêts. Ils participent également à des programmes nationaux dont ils assument fréquemment la direction. Les instituts nationaux sont les foyers des programmes d'envergure nationale.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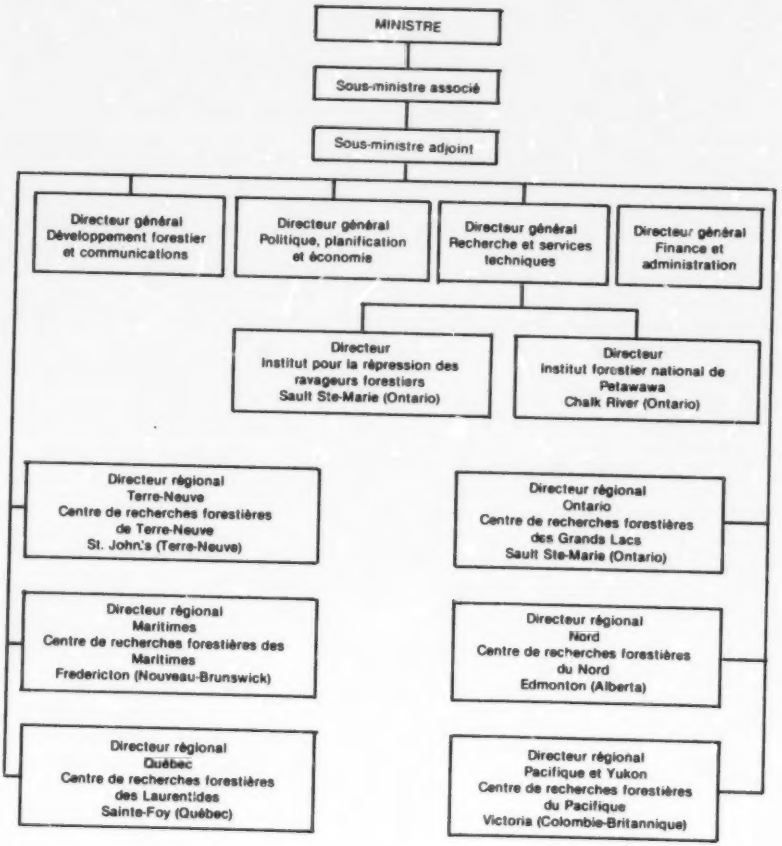
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FOREWORD

This program review of the Newfoundland Forest Research Centre, covers the period April 1984 to March 1985. The various projects and studies conducted during the year are listed, the achievements are outlined and a list of publications is provided.

The Newfoundland Forest Research Centre is one of six similar regional establishments operated by the Canadian Forestry Service. It is responsible for research in forestry and related fields and has the federal responsibility for negotiating and implementing forestry cost-shared agreements between Canada and the Province.

The highlights of this review period included:

- A new study to examine biometeorological influences on forest productivity was initiated.
- Staff contributed to and edited the proceedings of a major silviculture symposium held in central Newfoundland.
- The Forest Insect and Disease Survey recorded several new infestations including a major outbreak of the hemlock looper.
- Technology Transfer in Forest Protection was increased and involved: seminars on forest pests being presented to personnel of cooperating agencies; participation of staff members at the CANUSA International Conference on the spruce budworm; a workshop with a field trip for representatives from universities, CFS establishments, industry and government to assess the status and future trend of damage associated with the four-eyed spruce bark beetle and Armillaria root rot.
- Participation in a special job creation program, Environment 2000, which created 5000 weeks of employment on 26 projects.
- Negotiations being initiated for a new Canada/Newfoundland Forestry Agreement.

Dr. W. J. Carroll retired as Regional Director after 35 years of service.

During the fiscal year 1984-85 the staffing complement was 73 person years and approximately 10 person years of student employees. Overall expenditures of regional operations were approximately $4.0 million for salaries and operational expenses. Additionally $15.3 million was contributed to the Federal-Provincial Forestry Agreement.

J. A. Munro
A/Regional Director

TABLE OF CONTENTS

	Page
FOREST RESOURCES AND ENVIRONMENTAL RESEARCH	
Forest and Plant Ecology	2
Tree Seed and Improvement Research	4
Reforestation	5
Tree and Stand Growth	7
Energy from Forest Biomass	8
FOREST PROTECTION RESEARCH	
Pest Biology Research	10
Biological Control Research	12
Forest Insect and Disease Survey	13
FORESTRY DEVELOPMENT	
Policy Implementation — Development Agreements	15
Advice and Consultation Services	16
Economic Studies	16
INFORMATION AND TECHNOLOGY TRANSFER SERVICES	18
GENERAL RESEARCH SUPPORT SERVICES	20
FINANCIAL AND ADMINISTRATIVE SERVICES	24
APPENDICES	
Expenditures	26
Research Project Contracts	27
Organizational Chart	28
Publications	30

FOREST RESOURCES AND ENVIRONMENTAL RESEARCH

A. B. CASE — PROGRAM DIRECTOR

Project 2314
Forest and Plant Ecology
Project Leader: W. J. Meades

Objectives: To determine the ecological relationships between major vegetation types of Newfoundland and Labrador and their natural environment to develop an increased understanding of the reaction of major vegetation types to man's activities: i.e., drainage logging and fire; to increase knowledge of autecology of species having particular importance in Newfoundland and Labrador; to apply the data bank generated from such studies to forest and other land management problems; to provide leadership and technology transfer in ecological land classification and peatland development.

Achievements Current Year: Peatland research concentrated on development of experimental design and instrumentation for a peatland afforestation experiment. The experiment will study ditch spacing, species (black spruce and eastern larch), and fertilization as major variables controlling the success of tree establishment and growth on peatlands. The study is being undertaken as a part of a graduate program at the MaCaulay Institute in Scotland.
Forest and heathland research has concentrated on completion of studies in eastern Newfoundland and developing a proposal for funding future technology transfer of information under the next forest subsidiary agreement. A draft report and maps for a pilot study on mapping logging sensitivity was completed and presented to an advisory committee representing provincial and federal departments and the forest industry. A poster presentation on the stability of the boreal forest-heath ecotone was presented at 1984 Ecological Society of America — American Institute of Biological Sciences meetings.
Studies on the autecology of red pine, white spruce and larch continued. A paper on the distribution and growth of larch was presented at the Canadian Botanical Association meetings and the North American Forest Soils Conference. Studies on the ecology of Newfoundland soils produced two papers at the IUFRO meeting in Switzerland and a presentation on Newfoundland soils at the Memorial University — Canadian Forestry Service "Forestry in Newfoundland" lecture series.
Membership was maintained on national working groups on Wetland Classification, Ecoregions and Vegetation Classification. In addition, several local presentations and lectures were given for Memorial University and the National History Society. Local membership has been maintained on the Wilderness and Ecological Reserves Advisory Council.

Goals for 1985-1986: To plant black spruce and larch on a peatland forestry research site and monitor the impact of drainage intensity, surface preparation, fertilization and peatland type on growth, to complete a chapter for the book entitled "Wetlands of Canada"; to present two site classification workshops for industry and provincial government foresters; to publish information reports on heathland and forest

classification in eastern Newfoundland; to initiate a new study on allelopathic relationships between ericaceous shrubs and black spruce; to initiate classification of disturbed forest sites in western Newfoundland; to complete papers on the autecology of red pine and larch; to prepare an information report on site classification of spruce decline plots and budworm impact plots; to produce two chapters for a book on geobotany; to produce papers on the frozen organic soils and marshes of Labrador.

List of Studies

Ecological investigation of wetlands for forestry
Leader — E. D. Wells
Ecological investigations of heathlands
Leader — W. J. Meades,
(A. Mallik — visiting fellow)
Forest classification, ecology and mapping
Leader — W. J. Meades, R. Van Kesteren
Autecological studies of major trees, shrubs and related vegetation
Leader — B. A. Roberts
Ecology of Newfoundland soils
Leader — B. A. Roberts

Project 2301
Tree Seed and Improvement Research
Project Leader: J. P. Hall

Objectives: To evaluate the productive potential through species and provenance testing, breeding and selection of various native and exotic tree species suitable for reforestation in Newfoundland; to provide technical assistance and services to provincial government and industry in Newfoundland and to outside agencies to ensure that research findings are translated into economic and environmental gains.

Achievements Current Year: Native species — Variation in phenology, growth and frost hardiness of 10 year old *black spruce* has been studied and results published. Estimates of genotypic stability and provenance quality indices of 57 provenances have been published. The genetics of cone morphology has also been published. In 1982, 1983 and 1984 controlled pollinations were completed on 12 mother trees comparing varying degrees of inbreeding from 0-100%. A publication on the relationship between growth rate and wood density data has shown that the two parameters are not related and that selection of fast-growing individuals would not result in a lowering of wood quality. A study to evaluate exogenous growth substances for induction of flowering on black spruce has been published. A review of seed procurement procedures in Newfoundland has been published. Studies were completed on the relationship between climate and pollen formation and preliminary criteria for selecting plus trees of *Larix laricina* were developed. **Exotic Species** — The provenance experiments of *Sitka spruce* were measured at the age of 20 years. Results of measurements of *red spruce*, twenty-five years from seed, have shown considerable intra- and inter-provenance variation but not all provenances from any particular area were consistently better nor were any suitable for planting in Newfoundland. All plantings of exotic species in Newfoundland were evaluated and the results published. Seed of exotic Larix and Alnus species was planted in the field. Pollen development studies in exotic species were completed.

Goals for 1985-86: Native Species — Continue remeasurement of black spruce provenance trials; continue testing of flower-induction methods; analyze 25-year data from white spruce provenance trial and continue controlled pollinations within and among provenances, and continue hybridizations in larch. **Exotic Species** — Complete 20-year remeasurement of Sitka spruce provenance trials; remeasure species trials (20 years from seed) and continue introduction of exotic species.

List of Studies

Genetic improvement of native conifers
Leader — J. P. Hall

Genetic improvement of exotic species in Newfoundland
Leader — J. P. Hall
Advisory services to the Tree Improvement Working Group
Leader — J. P. Hall

Project 2302
Reforestation
Project Leader: J. Richardson

Objectives: To develop and demonstrate silvicultural techniques required to overcome site problems adversely affecting forest productivity on each of the major forest, peatland, and heathland types; to determine techniques for maximizing forest productivity through intensive management involving reforestation and silvicultural treatments.

Achievements Current Year: Progress continued in developing regeneration stocking survey methodology and standards for Newfoundland. Detailed studies of spatial distribution and stocking of conifers on recently disturbed sites were initiated. A preliminary set of standards was developed for black spruce regeneration. A study of the potential of large-scale aerial photography for regeneration surveys was completed and a contractor's report produced.
NeFRC continued to provide advice on forestry use of herbicides to a joint Provincial/forest industry technical working group to develop a proposed five-year forestry herbicide application program and was represented on an Environmental Assessment Committee to assess this proposal. A second cooperative series of trials was continued to compare the performance of various grades and sizes of black spruce bareroot planting stock on a variety of sites. Survival and growth of seedlings in all plantation trials were monitored on a cooperative basis. Biometeorological studies to investigate the impact of climatic variables on forest establishment, growth and productivity were expanded and a proposal was developed for future investigations of wind effects on forest stand dynamics and forest management strategies.
Cleaning, trail-cutting and other improvements to the demonstration area at the North Pond experimental site continued and a major publication on the area published. Tours of the area were conducted for several professional and student groups.

Goals for 1985-86: Information reports will be prepared on large-scale aerial photography and on hardwood control in western Newfoundland; a joint research proposal to investigate alternative weed control strategies

on selected sites will be developed in collaboration with the Provincial Department of Forest Resources and Lands and Forest Pest Management Institute; a D.Phil. study on stand structure and dynamics of balsam fir in relation to wind will be initiated; field investigations leading to the development of flexible stocking standards for black spruce, balsam fir and mixed spruce-fir forest types will be conducted; permanent sample plots on the North Pond demonstration site will be cleaned and maintained and plot data will be upgraded; potential silvicultural demonstration areas will be investigated and documented; planting trials will be checked for survival and cleaning and maintenance will be conducted at seven installations; a new study to investigate biological aspects of site preparation will be initiated.

List of Studies

Competition control on forest sites
Leader — J. Richardson
Influence of biometeorological factors on forest productivity
Leader — A. W. Robertson
Development of stocking survey methodology and standards for Newfoundland and Labrador
Leaders — P. F. Newton, J. M. Butler
Silvicultural workships and demonstrations
Leaders — J. Richardson, V. Chaffey
Plantation research
Leader — J. Richardson
Site preparation research
Leader — Vacant

Project 2303
Tree and Stand Growth
Project Leader: R. S. van Nostrand

Objectives: To examine and assess the processes involved in tree growth and stand development as a basis for growth and yield prediction; to determine the effect on growth and yield of natural and man-caused perturbations and stand manipulation practices in relation to site, density and species composition; to interface with forest agencies to ensure effective transfer of research information and knowledge on data collection, tree and stand development and yield prediction.

Achievements Current Year: A preliminary stand-level yield-density model for black spruce on medium sites in central Newfoundland has been calibrated and employed in combination with seedling distribution data to derive stocking standards in relation to forest management objectives. Seminars were given to potential users (i.e., forest industry and provincial government concerns) and their suggestions accommodated. One new pre-commercial thinning trial was established in dense 14 year old balsam fir in western Newfoundland. This is the eighth trial established as part of a series of thinning experiments on a number of sites across the Island. Four levels of spacing and one level of fertilization are being tested.

Goals for 1985-1986: To complete the analyses of the forest fertilization trials and prepare a report for publication; to establish one new pre-commercial thinning experiment and apply fertilizer to three previously established experiments; to examine and classify sites on all previously established thinning trials; to complete the PhD thesis on respiration and growth and prepare one to two journal papers for publication; to collect stem analysis data from additional vegetation-soil groups for site assessment on recently disturbed areas.

List of Studies

Influence of stand density and fertilization on productivity of natural and planted softwood.
Leaders — M. B. Lavigne and R. S. van Nostrand
Quantitative site assessment on recently disturbed areas.
Leaders — P. F. Newton, W. J. Meades
Predicting tree and stand growth for silviculture and management applications.
Leader — M. B. Lavigne

Project 2501
Energy from Forest Biomass
Project Leader: R. S. van Nostrand

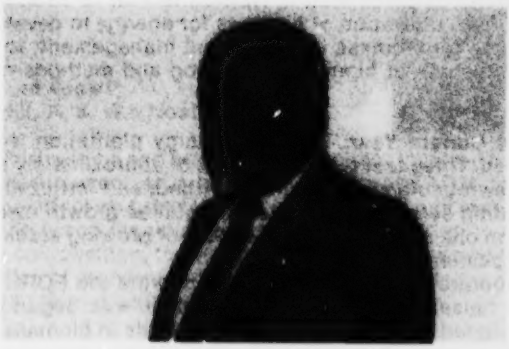
Objectives: To determine the feasibility of harvesting and using forest biomass for energy production in Newfoundland; to develop long-term strategies for the utilization of biomass for energy; to develop methods and techniques for biomass inventory and management; to assess environmental impacts of biomass harvesting and methods of reforestation.

Achievement Current Year: The Salix energy plantation work (PL-172) was continued. Three test plantation sites of approximately two ha each in central Newfoundland, were cleared, titled, and fertilized in preparation for planting selected Salix clones. Detailed growth measurements were taken on one-and two-year-old shoots of growing stock. Additional cones were planted for testing.
Field and laboratory work necessary to calibrate the FORCYTE growth for selected balsam fir sites in Newfoundland was begun (P-264). The model is designed to determine long-term trends in biomass production and nutrient cycling on sites under intensive management.
An experiment was established to determine the optimum interval between harvesting and establishment of a softwood stand in relation to changes in moisture, nutrients, and vegetation (P-145).
A poster depicting forest biomass utilization for industrial heat energy in Newfoundland was presented at the Bio Energy '84 Conference in Gothenburg, Sweden.
A review of commercial and industrial wood/peat energy in Atlantic Canada for the period 1978-83 and beyond was published.

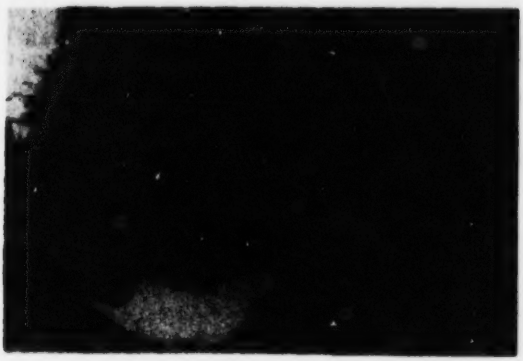
Goals for 1985-86: To further expand the Salix energy plantation work by planting the three tests plantation sites with selected clones; to maintain and test a biometeorological station and study the correlation between diurnal growth patterns and climatic variables; to continue the study of insects affecting Salix biomass production and to conduct productivity studies (P-172); to complete the collection and analyses of data necessary to calibrate the FORCYTE growth model (P-264); to record appropriate ecological data and complete the second planting of black and white spruce on hardwood sites harvested for fuel chips (P-145); to develop ENFOR project proposals for 1986-87.

List of Studies

Reforestation after whole-tree chipping for hog fuel
Leader — R. S. van Nostrand, V. Chaffey
Boreal energy plantation R & D
Leader — Alexander Robertson, C. French
Calibrating the FORCYTE growth model for Newfoundland forest types.
Leader — W. J. Meades



J. HUDAK — PROGRAM DIRECTOR



Project 2402
Pest Biology Research
Project Leader: A. G. Raske

Objectives: To develop effective and practical methods for measuring population levels of forest pests and their natural control factors; to investigate the biology of pest insects and diseases including their population dynamics; to assess insect and disease impacts on major age classes of forest trees and stands; to develop methods to prevent or minimize forest losses.

Achievements Current Year: Annual estimates of spruce budworm population levels, rates of parasitism and other mortality factors has been completed for 10 complete budworm generations. Permanent plots to determine budworm impact were remeasured for damage and some of the plot trees were cut for growth-ring analysis. Data from the Bowater permanent inventory plots (now Corner Brook Pulp and Paper owned by Kruger) were analyzed for severity of budworm-caused tree mortality. Variation in vulnerability to budworm damage of various stands types was determined with data from aerial photography.
Work continued on the identification of the hemlock looper pheromone and partial identification has been accomplished.
In permanent plots, trees continued to be successfully attacked by the four-eyed bark beetle. Attacked trees ranged from 10 to 90% of crown mortality. the major pheromone of this bark beetle is a modified terpene found in the inner bark. Other trace elements are yet to be identified. Several pheromones were tried in the field but all failed to attract.
Several young balsam fir were artifically defoliated and other young fir trees were defoliated by spruce budworm larvae placed on the branches. Budworm larval densities differed such that ten defoliation classes resulted. These trials will measure the effect of defoliation on growth with greater precision than has been possible up to now. The cone insects of black and white spruce, balsam fir and larch were surveyed again in 1984 and germination tests started to quantify seed losses caused by insects. Studies on the spruce bud midge started in 1984 and included aspects of life history, parasitism, distribution of larvae and damage to trees. Almost half of the midge larvae were parisitized in 1984. Trees with their terminal leader-bud attacked had shorter height growth than trees with undamaged leader-buds.

Goals for 1985-86: This year witnessed the resurgence of the hemlock looper to outbreak levels, and some resources will be shifted to monitor its population level, assess its impact, and learn more about the factors influencing its change in population levels. Spruce budworm studies will continue with data being analyzed and published. Attempts to introduce exotic budworm parasites will continue. Stands damaged several years ago by the budworm, and sampled for severity of Armillaria root rot infection will be resampled to determine change in stand-resistence for Ar-

millaria attack. Other impacts of the budworm on semi-mature and mature trees will be monitored and defined. Data on bark beetle biologies will be analyzed and published. Damage to cones and seeds including damage by squirrels, will continue to be quantified in several study areas. Studies on the bud midge are expected to continue leading to a better understanding of the total picture of the effect of this insect on regenerating areas.
Deterioration and decay of damaged trees has concentrated on balsam fir, but similar studies are in progress for black spruce damaged by the spruce budworm.

List of Studies

Cone and seed fungi of softwood
Leader — Vacant
Factors damaging to cone crops
Leader — R. West
Development of damage from balsam woolly aphid in balsam fir stands
Leader — E. J. Dobesberger
Sex pheromone(s) of the eastern hemlock looper
Leader — K. P. Lim
Armillaria root rot
Leader — Vacant
Deterioration of trees damaged by insects
Leader — G. R. Warren
Decay, microflora and wood quality of living trees
Leader — G. R. Warren
Role of woodborers and bark beetles in tree mortality and deterioration
Leader — A. G. Raske
Population studies of the spruce budworm
Leader — E. J. Dobesberger
Biocontrol factors of spruce budworm
Leader — K. P. Lim
Impact of spruce budworm on immature stands
Leader — E. J. Dobesberger
Impact of spruce budworm on semi-mature stands
Leader — A. G. Raske
Impact of spruce budworm on wildlife forage
Leader — A. G. Raske
Impact of spruce budworm on forest succession
Leader — W. J. Meades
Plantation and regeneration insects
Leader — R. West
Field efficacy tests of insecticides against the hemlock looper
Leaders — A. G. Raske, K. P. Lim, R. West
Impact of hemlock looper on forest stands in Newfoundland
Leader — A. G. Raske
Mobilization of food storage compounds in balsam fir and black spruce in relation to defoliation
Leaders — A. G. Raske, M. Lavigne

Project 2404
Biological Control Research
Project Leader: K. P. Lim

Objectives: To develop effective biological control of forest pests; to evaluate the effect of chemical insecticide(s) on biological control agents of forest pests; to investigate the potential use of entomogenous nematode as a biological control agent of forest pests.

Achievements Current Year: Nuclear polyhedrosis virus was again applied against newly hatched larvae of European pine sawfly in St. John's and Mount Pearl. Results of the field test of the virus were presented at the Annual Meeting of the Entomological Society of Canada. Females of *Olesicampe geniculatae*, the larval parasite of the mountain ash sawfly, were released in a field cage and open released in Oxen Pond Botanic Park. A fungal disease, caused by *Entomophaga virescens*, was detected on the black army cutworm at the West Pond area.
A research contract conducted by Memorial University of Newfoundland on the "Feasibility of the Use of Rhabditid Nematode for Control of the Spruce Budworm" was completed. A new research contract on the "Development of Locally Isolated Parasitic Nematodes for Control of Forest Pests" is being initiated.

Goals for 1985-86: More emphasis will be placed on aspects of life history of parasitoid insects and host-parasitoid interactions. The following accomplishments are expected: (1) Additional larval parasites of the *mountain-ash sawfly* will be released into field cages. (2) *Hemlock looper* — The effectiveness of the introduced tachinid, *W. occidentalis*, will be monitored. (3) Provide scientific authority on research contracts on entomogenous nematodes.

List of Studies

Populations of biological control agents
Leader — K. P. Lim
Control of forest insect pests with nematodes
Leader — K. P. Lim
Effect of insecticides on parasites of hemlock looper
Leader — K. P. Lim

Project 2601
Forest Insect
and Disease Survey
Chief Ranger: L. J. Clarke

Objectives: To conduct systematic surveys of forest pest conditions, determine the extent of infestations, assess the impact, forecast impending conditions, and recommend control measures and when necessary evaluate the effectiveness of direct control measures; to provide forest pest data and related information for the National Forest Resource Data program of Canada.

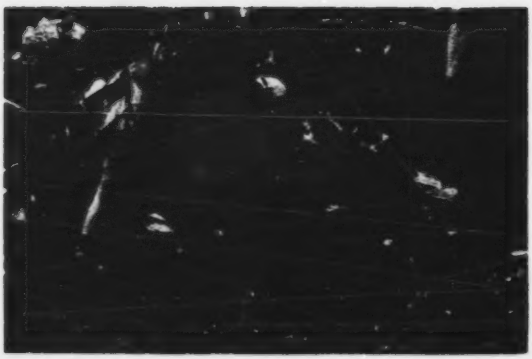
Achievements Current Year: The annual general detection, monitoring, appraisal and forecast of forest insects and diseases were completed, the data analyzed and interpreted, and presented to forest resource managers in the form of publications, reports, and at special seminars and meetings.
In 1984 the hemlock looper replaced the spruce budworm as the most important pest of Newfoundland forests. Population of the looper had been increasing in the last few years. Separate areas of defoliation occurred in numerous locations in all forested areas of the Island. The total area of defoliation was 95 000 ha with 53 000 of this total in the moderate and severe category. No measurable amount of tree mortality could be attributed to the hemlock looper. The looper was not found in Labrador in 1984.
Special pheromone trap surveys continued to be conducted in cooperation with Agriculture Canada to monitor the possible introduction of the gypsy moth and forest tent caterpillar. No gypsy moths were trapped but male moths of forest tent caterpillar were common in traps in western Newfoundland and a few in other regions including the Avalon Peninsula.
Scleroderris canker of pines was surveyed in the St. John's area with several new infection sites located. A second infection was found along the Salmonier Line. Several other tree diseases were recorded at low levels in the course of survey activities.

Goals for 1985-86: Continue surveys for detecting, appraising and forecasting forest pest conditions in general and with special emphasis on spruce budworm, hemlock looper, balsam woolly aphid, black army cutworm, Scleroderris canker, and general pest conditions in forest improvement areas; disseminate information to forest agencies and the general public through written papers, reports, seminars, workshops and verbal communications; provide information on forest pests for inclusion in national publications; cooperate with the Department of Forest Resources and Lands in the publication of information leaflets on common forest pests of Newfoundland.

List of Studies

Detection and forecasting forest pest conditions
Leaders — L. J. Clarke, G. C. Carew

J. A. MUNRO — PROGRAM DIRECTOR



Project 3603
Policy Implementation — Development Agreements
Project Leader: J. M. Butler

Objective: To discharge federal responsibilities for the implementation and evaluation of Forestry Subsidiary Agreements in Newfoundland; to plan for a new federal-provincial cost shared agreement to replace the existing agreement when it expires; to facilitate the transfer of new technology into the forestry sector in Newfoundland.

Achievements Current Year: Three projects were initiated on federal lands, two of which were in cooperation with Parks Canada. Several small scale in-house projects were also initiated under the New Employment Expansion and Development (NEED) program, which was another special job creation program funded by the Canada Employment and Immigration Commission.
In 1984-85 NeFRC was successful at implementing the forest conservation oriented job creation program Environment 2000. Twenty-seven projects valued at $1.1 million were completed. Projects were undertaken by sponsors such as development associations, community councils, and service clubs. The sponsors employed mainly youths and older workers on projects. Also in 1984, Forest Development staff played key roles in introducing new technology to Newfoundland particularly in the areas of prescribed burning, biomass harvesting, site preparation equipment, and geographic information systems.

Goals for 1985-86: Continue with management and evaluation responsibilities for the Forest Subsidiary Agreement. This is the final year of FSA II and it is anticipated that remaining expenditures will be approximately $10 million; complete planning for a new federal-provincial cost-shared agreement; develop a Forest Management Information System for the new forestry agreement; assist in the transfer of technology from outside Newfoundland — particularly in the areas of silviculture, wood products development and forest inventory.

List of Studies

Agreement Implementation
Leader — J. M. Butler
Agreement Technology Transfer
Leaders — J. M. Butler, W. L. Alexander, L. West
Agreement Evaluations
Leaders — D. Hayden, W. L. Alexander
Planning New Agreements
Leaders — J. M. Butler, D. Hayden

Project 1333
Advice and Consultation Services
Project Leaders: G. R. Milne, D. L. Hayden

Objectives: To provide economic advisory services to federal government departments, provincial authorities and industry for establishing sound forest resource development programs in Newfoundland and in the establishment of priorities for research and development activities of CFS.

Achievements Current Year: The principal accomplishments of the project have involved advisory services to federal and provincial authorities and forest industry. There is a constant requirement for such services. Economic advisory services were provided as required.

Goals for 1985-86: Provide economic advisory and consultation services to clients as required.

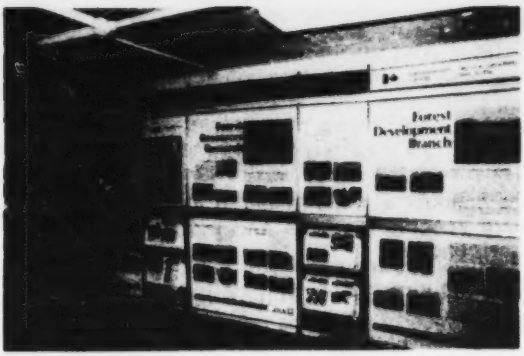
Project 1334
Economic Studies
Project Leaders: G. R. Milne, D. L. Hayden

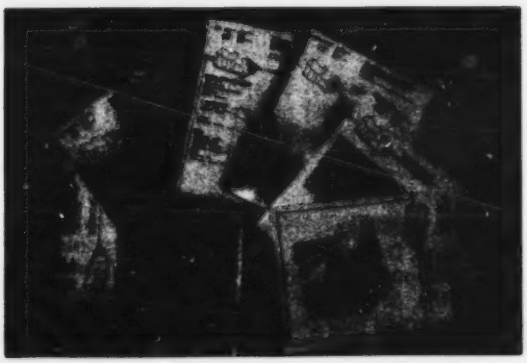
Objectives: to conduct applied research studies in forest economics directed toward specific resource and industry problems and opportunities in Newfoundland.

Achievements Current Year: Short-term economic studies have been conducted in response to problems requiring immediate action.
Major studies on the economic impact of the sawmill and wood industries sector were completed and results published and widely distributed throughout Newfoundland to promote public awareness and improve industry development opportunities. A directory of woodworking firms was published.
A study on the economic impact of spruce budworm losses was completed in co-operation with forest protection staff at NeFRC.
A vacant economist position was filled.

List of Studies

Short term economic analyses
Leaders — G. R. Milne, D. Hayden
Forest resource economics research
Leaders — G. R. Milne, D. Hayden
Forest industry economics research
Leaders — G. R. Milne, D. Hayden





Project 2604
Information and Technology Transfer Services
Project Leader: D. R. Rex

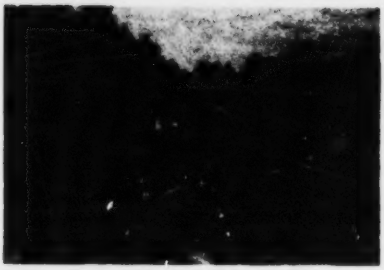
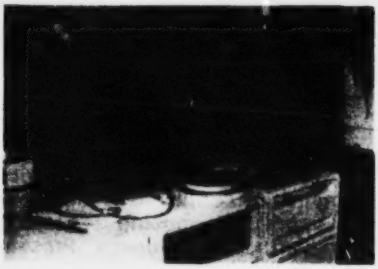
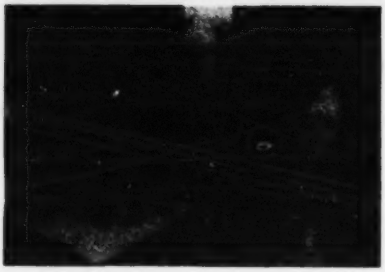
Objectives: To conduct a forestry relations program designed to improve awareness of ongoing research and development programs among client agencies, to promote an understanding of the wide use of forest resources among the general public and to publish and disseminate scientific and technical information.

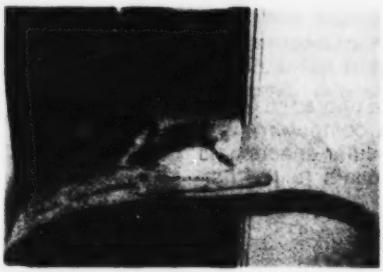
Achievements Current Year: Liaison activities with forestry staff of industry and provincial government continued to be a major part of the program. Additionally, committee and consultation meetings with cooperating agencies were increased. Editorial support was provided during production of information reports and technical leaflets. Requests from the general public were actioned as well as requests for technical support materials from specific client agencies. Media relations were increased through liaison and the preparation of press releases and background information. National Forest Week activities were expanded to include an open-house for members of youth organizations and the general public. The Centre's displays were set up in schools and malls throughout the region and in cooperation with Parks Canada during the summer months. Audio-visual materials, as well as selected audio-visual equipment were updated and made available to client groups. Arrangements were completed for distribution of bulk CFS materials through the unit offices of the Department of Forest Resources and Lands throughout the Province. Information Services specific to FSA II activities were ongoing. Woody Points continued to be revised and improvements implemented and a program review booklet was prepared.

Goals for 1985-86: Activities will continue to expand because of additional emphasis and responsibility being placed on information services by NeFRC management and CFS headquarters. Liaison activities with client agencies and specific public groups will increase. Woody Points newsletter will be prepared on a quarterly basis and information reports, press releases, background articles prepared. Support to CFS headquarters will be provided as requested. Committee work will continue and if operationally feasible, expanded to include support to other organizations. Displays will be further improved and expanded and will be available to cooperating agencies. Technical assistance will be provided to all cooperating agencies and general public groups as requested.

List of Studies

Public Information/Media Relations
Leader — D. R. Rex
Publication/Editorial Services
Leader — D. R. Rex
Extension Services
Leader — D. R. Rex



Project 2104
General Research Support
Project Leaders: A. B. Case, J. Hudak

Objectives: To provide an efficient and high quality support service to meet the needs of NFC research and development programs.

Achievements Current Year:

1. **Seed and planting stock service** — Regular nursery activities continued at the Pasadena Tree Nursery in support of ongoing research and establishment beautification projects. Presently the nursery contains approximately 60,000 seedlings ranging from 1 + 0 to 2 + 2 stock.

C. H. Evans

2. **Chemical and physical analysis laboratory** — Analyses on soil, plant and water continued as required. Digital's Data Trieve and BBN's RS-1 were examined as possible choices for forming part of the laboratory information system. A CBM-64 computer was successfully interfaced to both the atomic absorption spectro-photometer and auto-analyzer system.

J. G. Zakrevsky

3. **Plant Herbarium** — Specimens were upgraded to National Herbarium standards and a computer inventory for both vascular and non-vascular speciments was completed. General improvements to the herbarium facility continued.

S. M. Morgan

4. **Computer Services** — Data processing services and statistical analysis were provided in support of ongoing research and development programs. Both BMDP and Minitab Statistical packages were made operational. The DI-3000 graphics software was implemented and modified to make it easier for non-computer people to use. A forms management system was installed and is undergoing operational testing.

R. Hunter

5. **Mycological Herbarium** — Additional specimens were added to the collection bringing the total to over 2600. A slide collection of the most common and important diseases was prepared and a draft reference list of tree and shrub diseases was prepared.

G. C. Carew

6. **Insect reference collection** — Additional specimens were added to the more than 200,000 specimens of insects stored in the museum. A biological survey of forest insects was carried out in Labrador. Insect names were updated and a list compiled of nomenclature changes during recent years.

K. E. Pardy

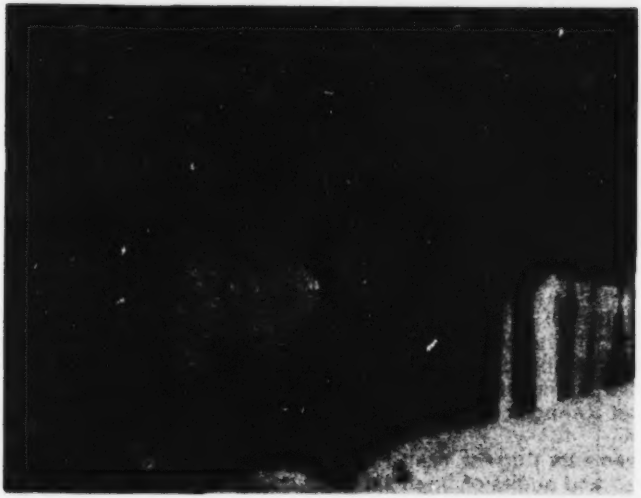
7. **Library services** — The monographic services were recatalogued from Oxford to the Library of Congress System. Approximately 1,300 serials were received and about 1,000 interlibrary loan items were processed. Binding of serials continued and material was collected for vertical files.

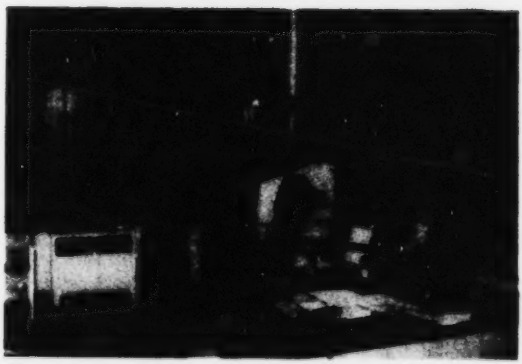
C. E. Philpott

8. **Greenhouse** — Approximately 90% of the modular nursery space was utilized. The watering system to modular units was improved.

G. J. Mills

Projections: Regular activities will continue in the mycological herbarium and a reference list of diseases of forest trees will be published. The biological survey in the northern part of the Island and Labrador will continue expanding the insect reference collection. A computerized accessions list will be prepared of plant herbarium specimens. Support services provided by Pasadena nursery will be continued as well as services provided by the Chemical and Physical Analysis Laboratory. Computer services will be improved and the use of all hardware and software promoted. Library and greenhouse support services will be provided as required.





Project 1401/1501
Accounting Operations/Administrative Services
A/Project Leader: W. F. Walsh

Objectives: To provide advisory services to management; to ensure internal control of finances; to maintain accounting records and to administer the financial controls on federal-provincial development agreements and job creation programs. Administrative services ensures effective administrative support in personnel and office services, materiel management, records management and field facilities.

Achievements Current Year: Financial Status reports were prepared as required and audits of financial transactions and related work were implemented and contained no major observations. Field and desk audits were carried out on all of the projects associated with the development agreement and special job creation projects. The AFMAS system continued to be updated providing more detailed information. Administrative Services continued to be upgraded including establishing a PE position in personnel to provide on-site services. Mail handling facilities were improved and a term position was assigned to assist in updating files and records.

Projections: Accounting and administrative services will continue to be provided as required. Improvements will include computerizing records and Materiel Management to ensure a more efficient administrative program.

NEWFOUNDLAND FOREST RESEARCH CENTRE
EXPENDITURES ($000) 1984-85

Program Areas	PY	Salaries	Env. 2000 Program	Development Agreement	S.C.S.E.P.	ENFOR	O & M	Capital	Totals
Management	4.0	220.7					15.2	5.4	241.3
Administration	17.57	403.1					101.2	101.9	606.2
Forest Resources	29.72	961.4			66.0	228.3	319.2	84.7	1 659.6
Forest Protection	26.17	705.8			58.2		281.0	29.3	1 074.3
Forest Development	5.44	210.8	1 233.7	15 302.7	7.7		63.1	16.1	16 834.1
Technology Transfer/ Information Services	1.0	41.2					37.2		78.4
Total	84.2	2 543.0	1 223.7	15 302.7	131.9	228.3	816.9	237.4	20 493.9

RESEARCH PROJECT CONTRACTS 1984-85

Contractor	Title	Amount ($)
Memorial University KH205-4-0066	Development of locally isolated parasitic nematodes for control of forest insect pests in Canada	$41,210.00
Memorial University KH205-4-0070	Deposition and mobilization of storage materials in black spruce in Newfoundland	25,047.00
Northland Associates KH205-4-0010	Calibration of the computer simulation FORCYTE growth model	55,000.00
Angelika West KH205-4-0065	Review of insects affecting yields of willow plantations	8,000.00
Queen's University KH205-4-0057	Development of an energy balance measurement system	25,542.00
Highlands Contracting KH205-4-0017	Establish experimental energy plantations	77,942.00
Abitibi-Price KH205-4-0069	Reforestation of areas harvested for biomass	14,507.00

STAFF LIST AND ORGANIZATION 1984-85

Regional Director - Dr. W. J. Carroll (retired July 84)
Secretary - E. E. Manuel
A/Regional Director - Dr. J. A. Munro

FOREST RESOURCES AND ENVIRONMENTAL RESEARCH
Program Director - A. B. Case

Chemical and Physical ..... J.-G. Zakrevksy, E.M. Pike
Analysis Laboratory ..... E.R. LeBreton
Forest Ecology - Impact Assessment ..... Vacant
Forest Ecology - Succession ..... W.J. Meades, A.R. Van Kesteren
Wetland Ecology ..... E.D. Wells, S.M. Morgan
Forest Ecology - Soils/Autecology ..... B.A. Roberts
Silviculture
- Forest Regeneration/Hardwood Control .. J. Richardson, V.D. Chaffey
Silviculture
- Mensuration, Biomass, Fertilization . R.S. van Nostrand, J.G. Donnelly
Silviculture - Stand Development ..... P. Newton, L. May
Tree Biology - Forest Genetics ..... Dr. J.P. Hall, W.J. Curran, P. Tricco
Ecophysiology/Stand Modelling ..... M.B. Lavigne
Pollution Ecology
- Air Pollutants and Toxic Chemicals ..... Dr. S.S. Sidhu, C.T. French
Herbarium Curator ..... S.M. Morgan
Nursery Services ..... C.H. Evans
Biogeography/Biometeorology ..... A.W. Robertson
Greenhouse and Projects ..... G.J. Mills

FOREST PROTECTION RESEARCH
Program Director - Dr. J. Hudak

Insect Populations ..... E. Dobesberger, J. Carter
Entomology - Cone and Seed Insects ..... Dr. R.J. West, D. Durling
Entomology - Damage and Impact ..... Dr. A.G. Raske, J.D. Rowe
Entomology - Biological Control ..... Dr. K.P. Lim, L. Oldford
Mycology, Pathology, Insect & Disease Survey ..... Vacant, G. Carew
Wood Deterioration & Decay ..... G.R. Warren, J.P. Meades,
A.L. Fudge, J.W. Marshall
Computer & Statistical Analysis ..... R.G. Hunter
Forest Insect & Disease Survey ..... L.J. Clarke, K.E. Pardy,
E.D. Banfield, D.S. O'Brien,
W.J. Sutton, D.M. Stone

FORESTRY DEVELOPMENT BRANCH
Program Director - Dr. J.A. Munro

Senior Economist ..... G.R. Milne
Senior Development Officer ..... J.M. Butler
Forest Development Officer ..... W. Alexander
Forest Development Officer ..... L. West
Secretary ..... M. Power

TECHNOLOGY TRANSFER/PUBLIC INFORMATION SERVICES
Head - D.R. Rex

ADMINISTRATION

Chief, Finance & Administration	(Acting) W.F. Walsh
Finance	E.C. Higdon, M.A. Martin, C. Prior
Purchasing	F.L. Bannister
Personnel	J.A. Landrigan
Library	C.E. Philpott
Central Registry	L.J. Fennelly
Office Services	M.F. Gillingham, B. Bartlett, E. Cooper
Field Station Facilities	W.V. Bonnell

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